

## **TABLE OF CONTENTS**

<b>FUNCTIONS OF THE BRIDGE DESIGN SECTION .....</b>	<b>1</b>
<b>BRIDGE DESIGN ORGANIZATION CHART .....</b>	<b>2</b>
<b>PROJECT DEVELOPMENT COORDINATION .....</b>	<b>3</b>
<b>TYPICAL PLAN PREPARATION FLOW CHART .....</b>	<b>4</b>
<b>TYPICAL PROJECT DEVELOPMENT SEQUENCE (IN-HOUSE PROJECTS) .....</b>	<b>6</b>
PROJECT DATA WORKSHEET .....	6
PROJECT TASK WORKSHEET (IN HOUSE PROJECTS).....	7
Project Task For Preliminary Plan Phase .....	7
Project Task For Final Plans Phase .....	8
PLANS DISTRIBUTION REQUIREMENTS FOR ALL PHASES OF PLAN DEVELOPMENT .....	9
<b>BRIDGE DESIGN AND PLAN PREPARATION.....</b>	<b>11</b>
<b>GENERAL GUIDE FOR BRIDGE PLAN PREPARATION.....</b>	<b>12</b>
PRELIMINARY PLANS .....	12
General .....	12
Preliminary Bridge Plans In Plan-In-Hand Form .....	13
Preliminary Bridge Plans In Final Form .....	14
Hydraulic Studies .....	15
Geotechnical Analysis.....	17
Boring Request Form.....	19
Preliminary Plan Payment Milestones Table.....	20
FINAL PLANS .....	21
General .....	21
Typical Bridge Details For Final Plans .....	21
Bridge Plans In Final Form (A.C.P's submittal procedure).....	27
Final Plan Payment Milestones Table .....	28
<b>CONSTRUCTION ENGINEERING SERVICES .....</b>	<b>29</b>
<b>DESIGN POLICY GUIDE FOR BRIDGES AND STRUCTURES .....</b>	<b>30</b>

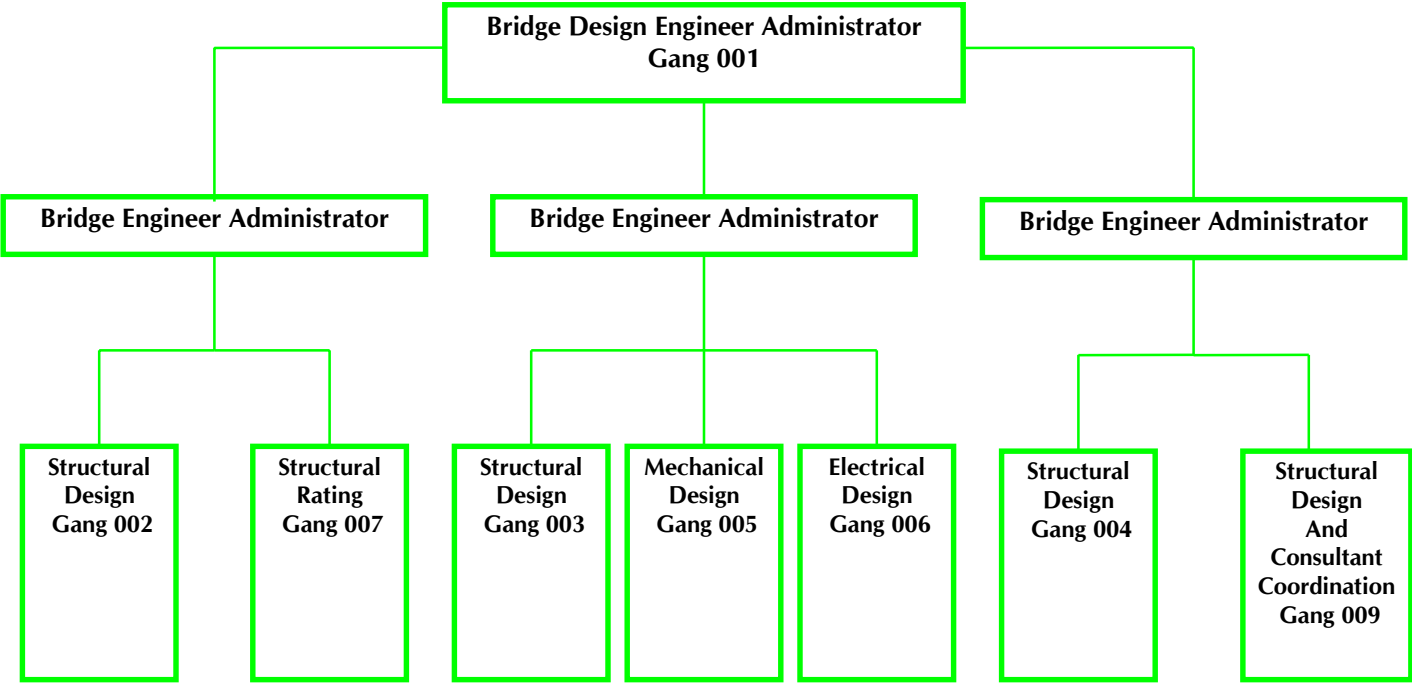
GENERAL .....	30
DESIGN .....	30
Design Specifications .....	30
Construction Specifications .....	31
Welding Specifications.....	31
Loading .....	31
Materials and Required Strengths .....	31
Utilities .....	32
Lighting and Permanent Signing.....	32
DETAILS .....	33
Detailing Practices .....	33
MISCELLANEOUS .....	34

## **FUNCTIONS OF THE BRIDGE DESIGN SECTION**

The primary function of the Bridge Design Section is to provide the necessary design and plan preparation expertise for various types of fixed and movable bridges. This may include either new bridge construction, bridge replacement or bridge rehabilitation projects. Some of the other functions of the Bridge Design Section are as follows:

1. To provide the design and plan preparation for bridge repairs and other bridge maintenance projects.
2. To provide the electrical, mechanical and architectural design and plan preparation for movable bridges, roadway lighting, communication systems, microwave towers, rest areas, weigh stations and buildings.
3. To maintain standard plans and special details for bridges, guardrail, and permanent signing.
4. To provide structural ratings for existing bridges, evaluate weight limits and effect of overlays on deficient bridges, and review bridges for overweight vehicle permits.
5. To coordinate, review, and administer funding for bridge projects prepared by consulting engineering firms under contract with the Department.
6. To provide technical engineering assistance, coordination and general information to other Department sections, state and federal agencies, legislative bodies and the general public.
7. To participate in various Department and National technical committees. To periodically review the AASHTO Standard Specifications for Highway Bridges and make recommendations for its update.
8. To coordinate construction permits with the various agencies involved with the projects.
9. To provide technical engineering assistance for research projects conducted by the Department.
10. To provide assistance to Construction Section for any field problems, which may occur, and to review and approve fabrication shop drawings.

**BRIDGE DESIGN ORGANIZATION CHART**



## **PROJECT DEVELOPMENT COORDINATION**

Each Department design project (consultant or in-house) is normally assigned a two coordinators, coordinator 1 and a coordinator 2. These coordinators are normally from the roadway design or bridge design sections.

The coordinator 1 is responsible for supervising the development of the road and bridge plans and to meet all project time deadlines. The Department maintains a computer database known as LETS on the mainframe computer system (CICSPROD), for all design projects. The LETS, Letting Schedule System, provides information regarding projects in the pre-letting stages of development. The Coordinator 1 is responsible for maintaining certain project information in LETS in an accurate and timely manner.

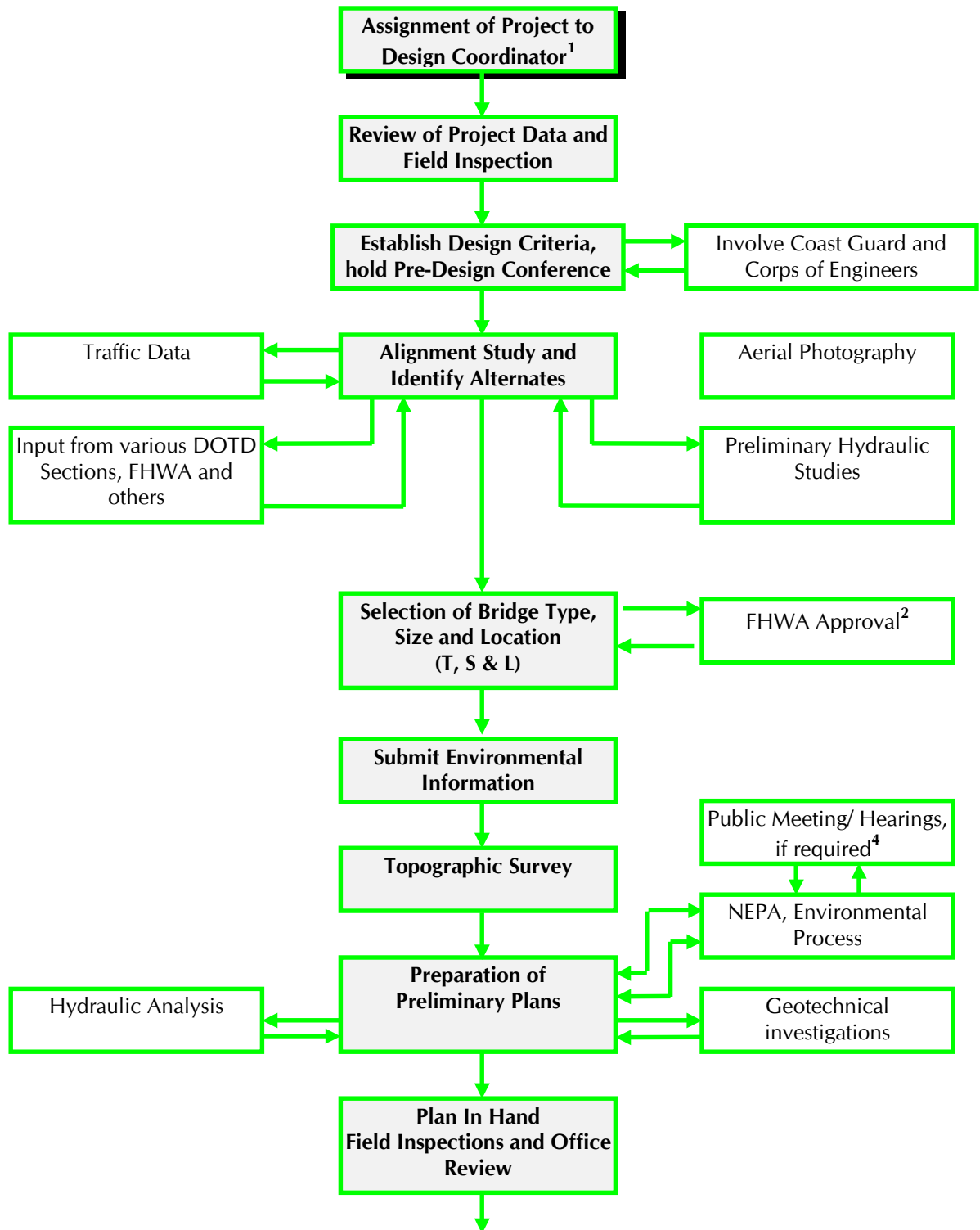
For specific information concerning the LETS System, contact the Department's Highway Needs Section.

A typical plan preparation flow chart is shown on page 4. Most projects will follow these steps although certain projects may require slightly different or additional steps. A typical plan development sequence is shown on pages 7 and 8. These sheets may be used as a worksheet for in-house projects.

Sample of data fields contained on LETS SYSTEM for each project:

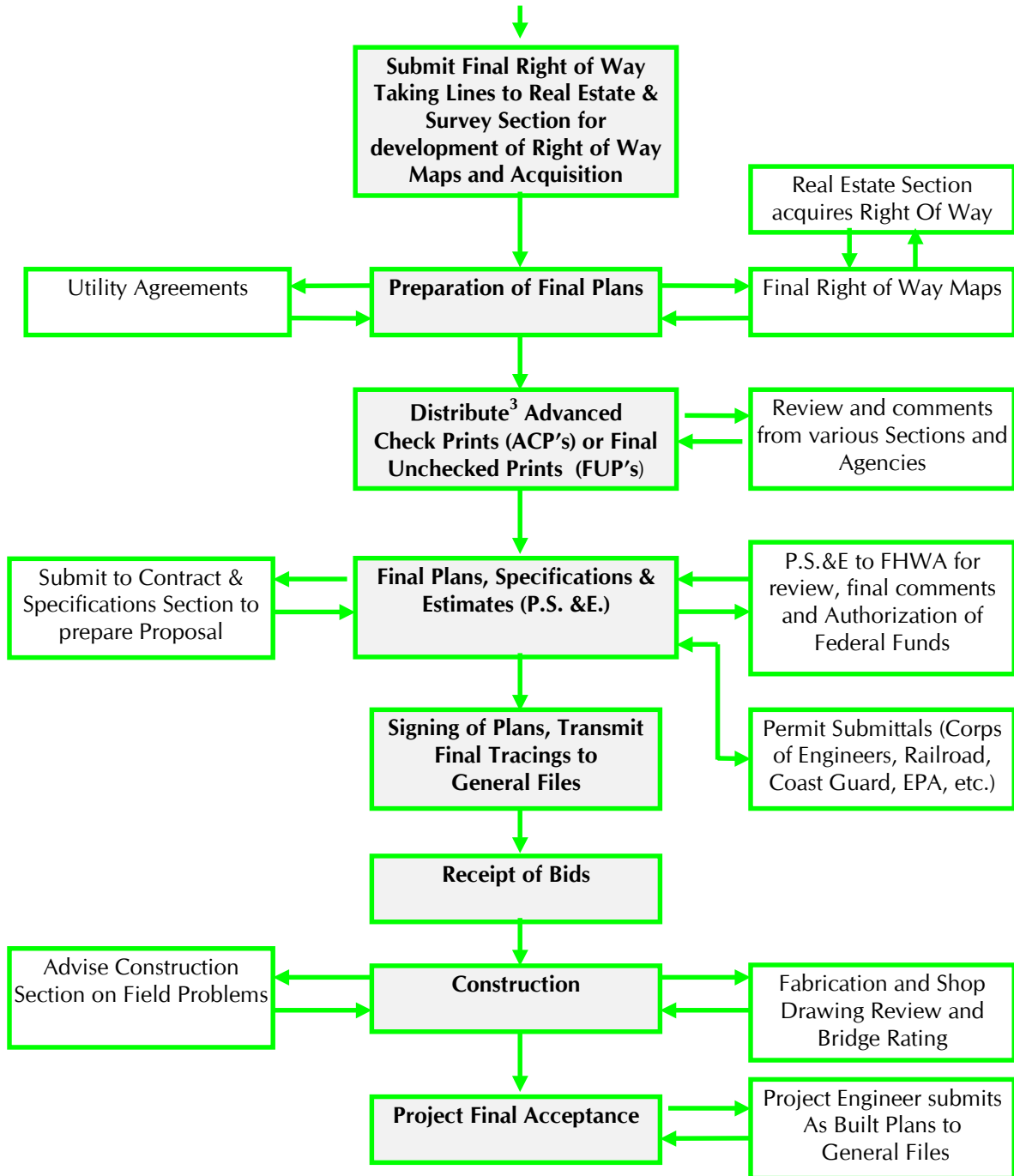
1. Project Numbers.
2. Project Description.
3. Coordinators.
4. Project time deadlines for environmental, survey, preliminary plans, advance check prints, P.S. & E, right-of-way, utilities, and letting.
5. Construction, engineering, right-of-way and utility costs.
6. Type of project funding.
7. Permit information.
8. Structure numbers and sufficiency ratings for bridges on a given project.

## TYPICAL PLAN PREPARATION FLOW CHART



Continued on the next page

Continued from previous page



<sup>1</sup> Project Coordinator (Bridge or Road Design) will be required to coordinate all meetings and plan submittals.

<sup>2</sup> FHWA approval is required on all NHS and IM projects.

<sup>3</sup> ACP's consultant projects, FUP's in-house projects

<sup>4</sup> Public Meetings / Hearings may sometimes be held prior to the survey. this will depend on the complexity of the project.

## PROJECT DATA WORKSHEET

F.A.P. No.: \_\_\_\_\_ Parish: \_\_\_\_\_

Miscellaneous comments: \_\_\_\_\_



## PROJECT TASK WORKSHEET (IN HOUSE PROJECTS)

<sup>1</sup> Project Task For Preliminary Plan Phase	COMPLETED DATE
1. PROJECT ASSIGNED TO COORDINATOR AND PROJECT NUMBER REQUESTED.	
2. REQUEST ADT & AERIAL PHOTOGRAPHY.	
3. MAKE INITIAL PROJECT SITE VISIT.	
4. ORDER EXISTING RIGHT-OF-WAY MAPS.	
5. SENT OUT PRELIMINARY PROJECT QUESTIONNAIRE TO DISTRICT FOR INPUT.	
6. DEVELOP ALIGNMENT AND DETOUR ALTERNATES AS NEEDED.	
7. HOLD PRE-DESIGN CONFERENCE.	
8. DEVELOP PRELIMINARY PERMIT INFORMATION FOR COAST GUARD, CORPS OF ENGINEERS, RAILROAD, ETC.	
9. SEND ALIGNMENT AND DETOUR TO DISTRICT, TRAFFIC AND PLANNING AND GEOMETRICS FOR REVIEW.	
10. SEND T, S, AND L(TYPE, SIZE AND LOCATION) TO FHWA FOR REVIEW.	
11. SEND PROJECT INFORMATION TO ENVIRONMENTAL TO START CLEARANCE PROCESS.	
12. HOLD PUBLIC MEETING OR PUBLIC HEARING IF NEEDED.	
13. ORDER TOPOGRAPHIC SURVEY.	
14. ORDER HYDRAULIC ANALYSIS.	
15. ORDER GEOTECHNICAL ANALYSIS. (BORINGS, CONSOLIDATION, SLOPE STABILITY)	
16. DEVELOP PRELIMINARY PLANS.	
17. HOLD PLAN-IN-HAND FIELD INSPECTION AND/OR OFFICE REVIEW.	
18. INCORPORATED PLAN-IN-HAND COMMENTS AND SEND FINAL RIGHT-OF WAY TAKING LINES TO REAL ESTATE TO DEVELOP R/W MAPS.	
19. PREPARE APPLICABLE PERMIT SKETCHES.	
20. OBTAIN ENVIRONMENTAL CLEARANCE BEFORE PROCEEDING TO FINAL PLANS.	

---

<sup>1</sup> Notes: FHWA is normally involved in plan review and approval on NHS and IM projects. The sequence as shown may vary depending upon project type and scope.

<sup>1</sup> Project Task For Final Plans Phase	COMPLETED DATE
1. PREPARE FINAL PLANS.	
2. SEND OUT ACP'S (ADVANCED CHECK PRINTS FOR COMMENTS).	
3. SUBMIT INFORMATION TO BRIDGE RATING ENGINEER TO DETERMINE IF RATING IS TO BE DONE IN-HOUSE OR BY CONSULTANT.	
4. SEND FINAL MATTE FILMS TO CONTRACTS SECTION TO PREPARE PROPOSAL.	
5. FINAL PROPOSAL SENT OUT FOR REVIEW.	
6. CHIEF ENGINEER SIGNS TITLE SHEET AND FINAL COST ESTIMATE.	
7. PLAN REVISIONS MADE IF NECESSARY.	
8. PROJECT IS LET AND BID REVIEW COMMITTEE MAKES REVIEW OF BIDS.	
9. CONTRACT IS SIGNED AND A WORK ORDER IS ISSUED.	
10. REVIEW ERECTION AND/OR FABRICATION SHOP DRAWINGS.	
11. ASSIST CONSTRUCTION SECTION ON ANY FIELD PROBLEMS. ASSIST IN PLAN CHANGES IF NECESSARY.	
12. PROJECT FINAL ACCEPTANCE AND PROJECT ENGINEER SUBMITS FINAL AS- BUILT PLANS TO GENERAL FILES SECTION.	

---

<sup>1</sup> Notes: FHWA is normally involved in plan review and approval on NHS and IM projects. The sequence as shown may vary depending upon project type and scope.

# DISTRIBUTION OF PRINTS BY BRIDGE DESIGN SECTION

PURPOSE (DIRECT LETTER TO:)	NO. OF SETS	FOR	SHEETS NEEDED	REMARKS
(10) TITLE WORK (REAL ESTATE)	3	REAL ESTATE SECTION	TITLE , PLAN & PROFILE	PARISH MAP & COPIES OF FIELD ROLL TO BE USED FOR HIGH PRIORITY PROJECTS
	1	UTILITY UNIT		
	1	PROJECT ENGINEER		
	1	DISTRICT UTILITY REPRESENTATIVE		
	1	LOCATION & SURVEY SECTION		
	3	ENVIRONMENTAL SECTION		ONLY IF FEDERAL AID PROJECT
BRIDGE HYDRAULICS <sup>(1)</sup> (HYDRAULICS)	1	HYDRAULICS	BRIDGE TYPE, SURVEY, FIELD ROLL, CROSS-SECTIONS	TO DEVELOP BRIDGE FINISHED GRADE AND SCOUR DATA
SUBSTRUCTURE <sup>(3)</sup> (GEOTECHNICAL)	3	GEOTECHNICAL ENGINEER	GENERAL PLAN OR FIELD ROLL AND PARISH MAP	ASK FOR CONSOLIDATION AND SETTLEMENT CURVES IF APPROPRIATE
ROAD DESIGN <sup>(1)</sup>	1	ROAD DESIGN SECTION	TITLE SHEET, G.P. & DET. SHT.	IF ROADWORK IS REQUIRED
GEOMETRIC REVIEW <sup>(2)</sup> (GEOMETRIC)	1	TRAFFIC & PLANNING DIVISION	TITLE SHEET, TYPICAL SECTION, P/P, GEOMETRIC LAYOUT	INCLUDE LAYOUT FOR CONSTRUCTION SIGNING
	1	GEOMETRIC DESIGN ENGINEER	FULL SET	
ENVIRONMENTAL <sup>(2)</sup> & COAST GUARD	1	PUBLIC HEARING & ENVIRONMENTAL IMPACT SECTION	PRELIMINARY PLANS	IF ENVIRONMENTAL CLEARANCE & COAST GUARD APPROVAL ARE NECESSARY BEFORE ADVANCING WITH PLAN-IN-HAND
(ENVIRONMENTAL & COAST GUARD)	1	COAST GUARD	TITLE SHEET, PLAN & PROFILE & BRIDGE GENERAL PLAN	
(21) PLAN-IN-HAND  (CONSTRUCTION)	1	CONSTRUCTION SECTION (HEADQTRS)	FULL SET W/ CROSS-SECTIONS	
	1	DISTRICT CONSTRUCTION ENGINEER		
	1	PROJECT ENGINEER	FULL SET	IF ROADWORK IS REQUIRED
	1	ROAD DESIGN SECTION		
	1	CONSULTANT		IF APPLICABLE
	1	DISTRICT UTILITY REPRESENTATIVE		
	1	REAL ESTATE DISTRICT OFFICER		
	1	REAL ESTATE, HEADQUARTERS		
	1	DISTRICT DESIGN, WATER RESOURCES, & DEVELOPMENT ENGINEER		
	1	UTILITY UNIT		
	1	FEDERAL PERMIT COORDINATOR		IF ENVIRONMENTAL PERMIT REQUIRED
	1	FHWA		ONLY ON NHS SYSTEM > \$1 mil.
	1	WILDLIFE & FISHERIES COMMISSION		
	1	PUBLIC HEARING & ENVIRONMENTAL IMPACT SECTION		ONLY IF FEDERAL AID PROJECTS
	1	ROAD MAINTENANCE SECTION		ONLY FOR R/R X-INGS
	2	PARISH OR CITY GOV'T AGENCY		PARISHES OF JEFF., PLAQ., EBR, ORLEANS , CADD
	1	HYDRAULICS		
	1	DISTRICT MAINTENANCE ENGINEER		
	1	TRAFFIC SERVICES		IF DETOUR/ CONSTRUCTION SIGNING
	1	DISTRICT TRAFFIC OPERATIONS ENGINEER		
(22) FINAL RIGHT OF WAY  (REAL ESTATE)	1	PROJECT ENGINEER	FULL SET & CROSS-SECTIONS	
	1	DISTRICT UTILITY REPRESENTATIVE	TITLE SHT., TYP. SEC., P/P, X-SEC.	
	10	REAL ESTATE SECTION	TITLE SHEET, TYPICAL SECTION & PLAN & PROFILE (P/P)	FOR RAIL ROAD CROSSINGS
	1	LOCATION & SURVEY SECTION		
	1	ROAD MAINTENANCE SECTION	TITLE SHEET & SPECIFIC PLAN & PROFILE	ONLY IF SEWERAGE EFFLUENT IS BEING DISCHARGED ON HWY. R/W (STORM SEWER DRAINAGE PROJECTS)
	1	PARISH OR CITY GOVERNMENTAL AGENCY		
	1	BRIDGE DESIGN PERMIT SECTION	TITLE SHEET & PLAN & PROFILE	FOR PERMIT DETERMINATION
	1	UTILITY UNIT		
	1	ROAD DESIGN SECTION	FULL SET	ONLY ON NHS SYSTEM > \$1 mil.
	1	DISTRICT CONSTRUCTION ENGINEER		
	1	FHWA	FULL SET	ONLY IF FEDERAL AID PROJECTS
	2	PUBLIC HEARING & ENVIRONMENTAL IMPACT SECTION		
(17) REVISED FINAL RIGHT OF WAY  (REAL ESTATE)	1	UTILITY UNIT	TITLE SHEET & PLAN & PROFILE	
	1	PROJECT ENGINEER		
	1	DIST. UTILITY REPRESENTATIVE		
	10	REAL ESTATE SECTION		
	1	LOCATION & SURVEY SECTION		
	1	DISTRICT CONSTRUCTION ENGINEER		
	1	FHWA		
	1	PUBLIC HEARING & ENVIRONMENTAL IMPACT SECTION		ONLY ON NHS SYSTEM > \$1 mil. ONLY IF FEDERAL AID PROJECTS

DISTRIBUTION OF PRINTS BY BRIDGE DESIGN SECTION (CON'T.)

[illegible]

☒ ALL SETS SHALL BE HALF-SIZED, EXCEPT FOR THOSE WHICH ARE SENT TO REAL ESTATE & DISTRICT UTILITY, WHICH WILL BE FULL-SIZED.

## **BRIDGE DESIGN AND PLAN PREPARATION**

The documents on the following pages, the "General Guide for Bridge Plan Preparation" and the "Design Policy Guide for Bridges and Structures" were prepared for the engineer and staff designated by the Department as responsible for the preparation of bridge plans. Projects may be performed by an in-house engineer or by a consultant engineer under contract with the Department. These documents are included in this manual strictly as a guide in preparing bridge plans. Variations are highly probable for individual projects, and it is the responsibility of the Engineer to recognize these variations. However, any departure from the normal procedures outlined herein, or elsewhere in the manual, should be only with prior approval of the Bridge Design Section.

In cases where the AASHTO Specifications allow more than one method of analysis, the method to be used requires the approval of the Bridge Design Engineer before proceeding with the project. This is also true in cases where the specifications may be unclear. Additionally, the Bridge Design Section has certain preferences for detailing. The engineer should check with the project coordinator to assure proper format, particularly on complex projects.

It will be the responsibility of the Engineer to keep their copy of the bridge design manual properly updated. This includes all bridge design manual revisions issued by the Bridge Design Engineer, which affect design, policies and procedures.

Each project will have a DOTD design coordinator for each in-house or consultant design project. For in-house design projects, the project coordinator shall be responsible to meet all applicable project completion deadlines. This includes the coordination of road and bridge plan development with various DOTD sections (Road, Environmental, Location and Survey, Hydraulics, Real Estate, Contracts, Construction, Utilities, DOTD Districts, Geotechnical, etc.), local and state agencies, Metropolitan Planning Organizations, Wildlife and Fisheries, D.E.Q., and federal agencies such as FHWA, Coast Guard, Corps of Engineers, FAA, etc. For consultant contracts, the coordinator will monitor the consultant's design and rating contracts which include review of the plans at various stages during preliminary design, final design, construction (fabrication drawing review), bridge rating and processing of invoices.

## **GENERAL GUIDE FOR BRIDGE PLAN PREPARATION**

The information contained herein has been compiled by the Department's Bridge Design Section setting forth requirements the Engineer is to follow and what services the Department will furnish in the preparation of bridge plans for given projects.

The Engineer is hereby forewarned that the Department has a preference for certain type of details and design philosophy for the bridge structures. The Department will furnish, as when available, and if requested, miscellaneous standard details and/or standard plans for a given project. The Engineer shall be responsible for obtaining a copy of the "Bridge Design Manual", which has been prepared by the Bridge Design Section of the Louisiana Department of Transportation and Development. The "Bridge Design Manual" makes policy statements and can be used as a policy guide for structural analysis and will aid the Engineer in developing bridge plans. However, the "Bridge Design Manual" covers only a small portion of the work that the Engineer may be required to perform. In addition, it is important that the Engineer become familiar with the Design Memorandums or revisions to the "Bridge Design Manual" issued as Memorandum to all Contractors prior to beginning any work.

### **PRELIMINARY PLANS**

#### General

1. For Consultant projects, it will be the responsibility to meet the requirements stated in the contract and the project schedule. Submittals should be in accordance with the Department's Bridge Design Section Policy or as requested by the coordinator. In general, for consultant contracts preliminary plans should be submitted at the 30, 60, 90, and 100 percent completion stage. These submittals shall include completed and partially completed plans, and calculations including hydraulics. Where applicable, a separate copy of hydraulic studies described elsewhere herein for bridge sites should be submitted to the Bridge Design Coordinator at the 60% completion point for review. At 100% preliminaries, final right-of-way taking lines should be completed. For guidelines for preliminary plan payment milestones for consultant projects, see page 20. For in-house projects the engineer may follow the plan development sequence guidelines as stated on pages 4 through 8 as a general guideline.
1. It is the Engineer's responsibility to submit a request as outlined herein for deep borings and fill height analysis as soon as possible in order to avoid delays. Additionally, the Engineer shall prepare the necessary permit sketches, drawings, etc., for the Corps of Engineers, Coast Guard, railroad company, Federal Aviation Administration, etc. A list of permits can be found in Chapter 7.
2. For each consultant project, regardless of prior approval, the Engineer shall prepare and submit a synopsis of the electronic data processing software which may be used in the design or the analysis of the bridges, retaining walls or other structural

elements. This information should be submitted to the Bridge Design Engineer for his review and approval prior to their use. The Bridge Design Engineer may require that sample problems be run and the results reviewed in order to assure acceptability of the proposed software.

### Preliminary Bridge Plans In Plan-In-Hand Form

Plans for the plan-in-hand field inspection shall be prepared in accordance with the following procedures and recommendations and shall contain at least the following applicable data:

1. Design criteria, specifications, loading, materials, traffic data, navigational aspects if applicable for the structural design, and the design criteria and proposed systems to be used in the mechanical, electrical or architectural portions of the project.
2. Prior to beginning work, the engineer shall obtain approval in writing, of any details or design features which vary from the Bridge Design Manual and Bridge Design Engineer's memoranda.
3. The Engineer shall obtain approval from the Department for the scale to be used in the plan and profile drawings and general bridge plans.
4. Plan and profile of each bridge structure showing, roadway alignment (both vertical and horizontal). Show profile elevations at centerline joint, each bent, the abutments, and beginning and end of the approach slab. Indicate location of the profile grade line (P.G.L.) on the general bridge plans. No station equations are to be used from beginning to end of any bridge structure unless approved by the Bridge Design Engineer. It is also the responsibility of the Engineer to determine from the survey level books which referenced datum was used to establish the project's vertical elevations.
5. Span lengths, location of expansion and fixed ends of spans, size and type of joints to be used, all horizontal and vertical dimensions and clearances, lane and shoulder width of the bridge and approaches, type and location of bridge drainage. Approach slab type and length revetment type and length at bridge ends.
6. Length and location of test piles including test pile length and tip elevations, size, number and length of piles for pile bents, and size, type, approximate number and length of piles for column bents and location of core borings.
7. Hydraulic data, (if applicable).
8. Right-of-way is shown on bridge plans if roadway plan and profile sheets are not part of the plan set.

9. Typical sections through bridge structure showing dimensions and details of proposed superstructure and substructure, such as slab thickness, beam spacing and depth, handrail and barrier details, type footings proposed, drilled shafts, pile footings, etc. The maximum foundation pressures and maximum pile loads are to be shown, where applicable, along with the size, length, and type of piles or drilled shafts. Framing plans, if applicable.
10. Detour layout
11. Additional miscellaneous information and details include, vertical and horizontal clearances, permanent signing, construction signing, lighting and utilities if available, superelevation diagrams, guardrail layout details, attenuators location, and stopping sight distance.
12. Preliminary design of structural components are required in order to determine beam spacing, column spacing, number of piles and any special features. Preliminary design computations may be requested for the Department's review and approval. A preliminary cost estimate should also be prepared for the project.
13. Sufficient economic studies will be made available if requested with regard to recommended bridge layout, span lengths, and structural types prior to pre-plan-in-hand submittal.
14. A plan-in-hand conference may be held after the plan-in-hand field inspection at which time special features will be discussed and determinations made, all of which shall be shown on the Preliminary Bridge Plans In Final Form.

#### Preliminary Bridge Plans In Final Form

After the plan-in-hand has been completed, the engineer shall submit the preliminary bridge plans in final form to the project design coordinator for approval. These plans shall reflect all agreements reached at the plan-in-hand stage and shall contain all applicable data described in items 1 through 6 on page 13. Required Permit sketches if applicable should be included. The Department is to obtain approval of the preliminary bridge plans from others involved such as the Federal Highway Administration, Railroad Companies, Corps of Engineers, Coast Guard, Federal Aviation Agency, etc., prior to beginning final bridge plans when it is required. The engineer will be required to prepare and modify any sketches, permit drawings, calculations, or provide any information in order for the Department to secure approval of the preliminary plans.

For consultant projects the Engineer will be authorized in writing by the Department's project design coordinator to commence with final design for the project.



## Hydraulic Studies

Hydraulic studies for the bridge site in general should include: determination of flood plain discharge for the design event; determination of normal water surface elevations and the stage-discharge relationship; design selection based upon computed backwater; determination of special requirements (scour protection, spur dikes, abutment protection); predicted scour depths; and documentation of design. The predicted scour elevation should always be shown on the general bridge plans and in the hydraulic data table. An example hydraulic data table is shown on the following page. The computed table should be included in the plan-in-hand prints, as well as in final plans

Formal documentation of all design considerations and the general design process will be made in the Hydraulic Report. The Hydraulic Report will include: a general discussion of the watershed and the scope of and the reasons for the proposed improvement; documentation of any coordination with other agencies or governments; brief discussion of any local or regional ordinances influencing design; general site data used in hydraulic design; general discussion of design analysis; final design recommendations; a general "Flood Hazard Summary". As with the hydraulic calculations, the complexity of the Hydraulic Report should be commensurate with the significance of the site from a flood hazard standpoint.

Hydraulics design, unless otherwise specified, shall be in accordance with the DOTD Hydraulic Manual; guidelines, procedures and examples are there in. Further questions pertaining to bridge hydraulic design should be directed to the DOTD Hydraulics Gang. For general rules regarding setting bridge finish grade elevations, refer to Chapter 3 of this manual.

**EXAMPLE BRIDGE HYDRAULIC DATA FORM**

**STATE PROJECT:** 029-02-0018

**STREAM NAME:** Forker Creek

**ROUTE:** LA 8

**BEGINNING STATION:** 16 + 35

**PARISH:** Vernon

**BRIDGE LENGTH:** 180 ft.

**STRUCTURE NO.:** 029-02-01561

**BASIN SLOPE:** 6.65 ft/mile

**PREPARED BY:** Joe Smith

**DESIGN STORM:** 25 years

**DATE:** May 14, 1996

**HYDRAULIC DATA TABLE FORM**

Drainage Area (sq.mi.): 7.57				
Flood Frequency (years)	25	100	Overtopping > 500	Scour Analysis 500
Discharge (ft <sup>3</sup> /s)	3036.72	4766.94	NA	7415.25
Design Water Surface Elev. (ft/ N.A.V.D- 88)	124.21	125.92	NA	128.74
Average Velocity (ft/s)	1.71	2.33	NA	3.21
Area of Opening (ft <sup>2</sup> )	1786.82	2045.16	NA	2292.73
Backwater (ft)	0.016	0.623	NA	1.902
Bridge Scour Elevation (ft)				96.10

**REMARKS:** Recommended finish grade elevation for a 25-year design flood is 127.23 ft/N.A.V.D- 88. Use 3:1 abutment slopes with flexible revetment extending 5 ft. outside the fascia of the structure on upstream and downstream side.

**BRIDGE SCOUR:** Scour depth = 7.55 ft. scour depth elev. = 96.13 ft./ N.A.V.D- 88

**EXISTING BRIDGE:** Length = 130.00 ft.

**DETOUR BRIDGE:** Design Frequency = 5 years. The 5 year Design Water Surface Elevation is 119.09 ft./ N.A.V.D- 88. A 140.00 ft. (or as required to span channel) precast concrete slab bridge at F.G. elevation of 123.03 ft./ N.A.V.D- 88 is recommended.

## Geotechnical Analysis

### GENERAL:

Normally, the location, number, and depth of soil borings will be recommended by the Geotechnical Design Gang. The boring request form on page 1 (19) shall be used to order borings, and consolidation tests through our Pavement and Geotechnical Design Gang. If slope stability analysis is needed this should also be discussed and requested at this time.

For borings done in-house, three (3) sets of plans with the information described in items "1 through 6" listed below should be transmitted to our Pavement and Geotechnical Design Gang. Upon receipt of this information, the Pavement and Geotechnical Design Gang will order the boring logs & any additional soil information as deemed necessary for the project, including a fill height recommendation.

Some Consultant contracts require the Engineer to furnish the boring logs and test reports. For those contracts, items "1 through 6" listed below are to be submitted to the Department for approval prior to obtaining borings.

There will be some projects in which sufficient existing foundation information is available, thus eliminating the need for additional borings and foundation studies. It will be the responsibility of the Project Coordinator to request this information in writing.

Boring logs shall be included in the plan-in-hand drawings. However, in some cases, when they are not available, plan-in-hand field inspections may be made without boring logs. The boring logs shall be required as a part of the preliminary bridge plans in final form. Correlation of boring logs to actual elevation will be required and will be the responsibility of the Engineer.

The Engineer is to obtain approval from the Department for all foundation (roadway and bridge) design criteria to be used on any project, prior to submittal of preliminary plans. This will include foundation types and lengths (footings, piers, piles, drilled shafts, etc.), pile supported approach slabs, fill heights, retaining wall and sheet pile wall types and consolidation criteria (surcharge, wick drains, etc.)

Foundation studies can change structures from culverts to bridges or vice-versa. Also, the type of substructure and superstructure can be changed by these foundation studies.

Preliminary plans will show controlling fill heights as determined by or approved by the Department.

A foundation report may be required in special cases. The extent of bridge foundation studies, embankment studies, and format for the soil report is to be approved by the Department. This work should be completed and approved prior to submittal of preliminary bridge plans in plan-in-hand form.

The following listed information shall be furnished when requesting borings to be done through the DOTD Pavement & Geotechnical Design Gang or if borings are to be obtained through Consultant Contract procedures:

1. Title sheet or vicinity map to locate projects.
2. Typical section of proposed embankment showing crown width and proposed side slopes.
3. Plan and profile of surveyed alignments and preliminary structure layout in plan and profile, submitted in 11"x17" (half-sized) format.
4. Plans to show approximate boring locations and recommended depths.
5. Type of structure being considered.
6. Fill heights and/or depth of cuts at bridge ends.

## Boring Request Form

(One boring request form per site)

### PROJECT INFORMATION

Construction  
No. \_\_\_\_\_ Engineering No. \_\_\_\_\_  
Project Name \_\_\_\_\_  
FAP No. \_\_\_\_\_ Structure No. \_\_\_\_\_  
Route \_\_\_\_\_  
No. \_\_\_\_\_ Parish \_\_\_\_\_  
Letting Date \_\_\_\_\_ Project Alignment (new/old) \_\_\_\_\_  
Prelim. Plans Date \_\_\_\_\_ ☐ English

### STRUCTURAL INFORMATION

Bridge Length \_\_\_\_\_ Pile Type \_\_\_\_\_ Pile load \_\_\_\_\_  
Beg. Abut. max. Fill Ht. \_\_\_\_\_ Crown Width \_\_\_\_\_ Slope \_\_\_\_\_  
End Abut. max. Fill Ht. \_\_\_\_\_ Crown Width \_\_\_\_\_ Slope \_\_\_\_\_  
Sheet-pile(s) \_\_\_\_\_ Wall Height(s) \_\_\_\_\_  
Ret. Wall(s) \_\_\_\_\_ Wall Height(s) \_\_\_\_\_  
Other \_\_\_\_\_  
Comments: \_\_\_\_\_

Structural Info. Completed by \_\_\_\_\_ Date \_\_\_\_\_

### FIELD & LABORATORY REQUEST

(to be completed by the Pavement and Geotechnical Design Section)

☐ Total No. Borings Requested \_\_\_\_\_

☐ Sampling Frequency \_\_\_\_\_ Boring No.(s) \_\_\_\_\_

■ Standard \_\_\_\_\_

■ Continuous \_\_\_\_\_

☐ Boring Depth(s) \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

☐ Water Table \_\_\_\_\_


☐ Consol. Testing \_\_\_\_\_

	Boring No.(s)	√ Sieve	√ Hydrometer	Depth
<input type="checkbox"/> Grain Size	_____	<input type="checkbox"/>	<input type="checkbox"/>	_____
	_____	<input type="checkbox"/>	<input type="checkbox"/>	_____
	_____	<input type="checkbox"/>	<input type="checkbox"/>	_____

COMMENTS: \_\_\_\_\_

\_\_\_\_\_

Field & Lab. Request Completed by \_\_\_\_\_ Date \_\_\_\_\_

 **NOTES:** Required Attachments

✓ 3 copies of general plans & location map (Materials)

✓ 1 copy of general plan (Pavement & Geotechnical)

Preliminary Plan Payment Milestones Table				
PAYMENT MILESTONE	TASKS	BRIDGE	COMMON	ROAD
30 % Distribution	Completed	1. Bridge hydraulic study and scour analysis 2. Type, Size & Location of Structure set 3. Deep Borings	1. Pre-design criteria established 2. Horizontal & vertical alignment set	1. Plan/profile sheets with existing topo. 2. Preliminary typical sections submitted for review 3. Title Sheet 4. Typical Section questionnaire distributed
	In Progress	1. Superelevation diagram 2. Economic study (if appropriate)		1. Preliminary typical sections being reviewed 2. Pavement Design 3. Soil borings and pH/resistivity data. 4. Capacity analysis
60% Distribution	Completed	1. Preliminary design of substructure & superstructure 2. Foundation analysis 3. General Plan 4. Typical bridge sections		1. Horizontal/vertical alignment on plan/profile sheets 2. Geometric details submitted for review 3. Hydraulic design submitted for review 4. Cross sections and required right of way 5. Final typical section
	In Progress	1. Span and bent details 2. Foundation layout 3. Framing plan	1. Sequence of construction & and construction signing	1. Earthwork computations 2. Construction notes & details
90 % Distribution	Completed	1. Bridge quantities and general notes	1. Assemble plans 2. Cost estimate	1. Geometric and hydraulic comments incorporated 2. Pre-plan in hand review
	In Progress		1. Pre-plan-in-hand review	
95 % Distribution	Completed		1. Plan-in-hand prints distributed	
100 % Distribution	Completed		1. Plan-in-hand inspection and comments addressed 2. Right of way taking lines set and transmitted to Location and Survey 3. Permit sketches 4. Revise cost estimate	

## FINAL PLANS

### General

1. For consultant projects the engineer shall become familiar with the requirements stated in the contract and the schedule for completion specified. It will be the Engineer's responsibility to meet the requirements stipulated. Submittals should be in accordance with the consultant's contract or in accordance with the coordinator's request. The plans are considered final only after the plans have been reviewed and commented on the advanced check prints (95%) and all corrections have been satisfactorily completed. In general, plans should be submitted at the 30%, 60%, 95% (ACP), 98%, 100%, and shall include completed and partially completed plans. For guidelines for final plan payment milestones for consultant projects, see page 28. Design computations are to be kept by the engineer until completion of the project. These computations are to be made available to the Department upon request. These computations should be subdivided into parts, such as substructure, superstructure, quantities, cost estimate, etc. Any changes required in the computations through the Department's review or otherwise shall be resubmitted with the final plans.
2. For in-house projects, the engineer may follow the plan development sequence guideline as stated on pages 4 through 8.
3. For consultant contracts the engineer shall prepare and submit a synopsis of the electronic data processing software which may be used in the design or the analysis of the bridges, retaining walls or other structural elements which have not been previously approved in the preliminary phase to the Bridge Design Engineer for his review and approval prior to its use. The Bridge Design Engineer may require that sample problems are run and the results reviewed in order to assure acceptability of the proposed software.

### Typical Bridge Details For Final Plans

Final Plans submitted to the Department for approval shall contain the following applicable data.

### INDEX TO BRIDGE PLANS

1. Index to include sheet numbers, and descriptive title of each drawing locating bent numbers, span numbers, special detail drawings, standard details, etc.
2. The Bridge Index may be combined with the General Index, which includes all plan drawings.

3. The General Index to all plans may be placed on the title sheet provided the index is not complex.
4. The index should be complete for ease of plan use.

#### GENERAL NOTES

1. General notes for the design and construction of all structures shall be combined into one sheet. There is usually a need for additional notes to be placed on structural detail drawings. A standard general note sheet is available through the Bridge Design Section, however modifications may be required to suit the particular project.
2. The General Notes should include the following: AASHTO design specifications under which the bridge structures are designed; the construction specifications under which the bridge structures are to be constructed; highway design speed, live load design vehicles, concrete instructions, reinforcing steel, welding structural metalwork, pile instructions, erection and construction procedures, etc.; all design criteria not specifically covered by the AASHTO design specifications, and any instructions considered necessary for the proper construction of the bridge structure.

#### SUMMARY OF BRIDGE QUANTITIES

1. The "Summary of Bridge Quantities" is a master summary for all bridge quantities. It shall include item numbers, item descriptions, units of measure, quantities for each item, sub-total quantities for each bridge and grand total for all bridge structures.
2. The grand total for each item from the "Summary of Bridge Quantities" must be included in the Master Summary of Estimated Quantities for the contract plans.



## BRIDGE PLAN AND PROFILE (GENERAL PLAN)

1. The plans shall include a plan and profile view of all bridge structures. The profile view should be detailed directly under the plan view, when practical.
2. The plan and profile drawings should include the following detail information when applicable. If any details on the general plan must be expanded upon because of complexity, a more specific detail sheet should be provided.
  - a) All bridge structures shall include finish grade (FG) elevations along the Profile Grade Line (P.G.L.) at all bent stations. Provide additional finish grade elevations at other locations, such as the gutterlines, if necessary for ease of construction.
  - b) Bridge profile to include stations along profile grade lines (or other control lines) at centerline of joint. The type, size, number and length of piles shall be shown. This information may be placed in tables, provided the tables and profile drawings are properly cross-referenced, and the bent information is properly correlated. The tables should be placed close to the plan and profile drawings. Blank spaces in the tables should be provided for the order length of piles.
  - c) Span length of each span along P.G.L.
  - d) Describe the type of spans to be used (prestressed concrete, welded composite girders, curved steel spans, etc.).
  - e) Spans and bents to be identified by number or some other method acceptable to the Department.
  - f) Location and description of permanent signing and lighting stations.
  - g) Location of expansion and fixed ends of spans.
  - h) Stopping sight distance and horizontal and vertical curve data if applicable.
  - i) The actual horizontal and vertical dimension clearances to the bridge structures for railroad, waterways or highway applications.
  - j) Show details identifying the type and limits of erosion control material such as riprap and flexible revetment including underground toes of slope.

- k) Plan view showing the location and width of traffic lanes and shoulders, both on and off the bridge. The fore and side slopes of the embankment, if applicable.
- l) Deck drainage, subsurface drainage, and existing utilities. Provide special drawings for complex bridge structures.
- m) Hydraulic data table, if required. Also the name of the waterway, direction of flow, high water and low water elevations and spur dike details if required.
- n) Guardrail details and layout data at bridge ends. May be placed on separate detail sheet if needed for more complex details.
- o) Location of test piles, core borings and cone penetrometer probing. This information is to be shown on the foundation plans when required.
- p) Location and description of temporary and permanent attenuators and backup walls for attenuators.
- q) Location of any required permanent or temporary sheet pile walls.

#### TEMPORARY CONSTRUCTION SIGNING, DETOUR LAYOUT AND SEQUENCE OF CONSTRUCTION

1. Temporary construction signing and sequence of construction detail sheets should be provided to direct existing traffic through the construction sites.
2. If a bridge or roadway detour is required for the project, plan and profile detail sheets of the detour, shall be included.

These sheets may either be provided in the roadway or bridge plans depending on the type of project.

#### FOUNDATION PLAN

1. A foundation plan shall be provided for all bridge structures (except as noted below) and shall include the following:
  - a) All necessary details, dimensions, angles, and controls for ease in locating the foundations for bridge structures.
  - b) Overlay of existing foundations to identify any potential conflicts with new foundations.

- c) Footings for column bents shall include the type of footings (typical footings may be detailed on special drawings and tabulated as to Type A, B, C, etc.) the elevation of the bottom of footings, schematic location of piles, direction of battered piles, bent numbers, station of centerline of each bent along profile grade line.
- d) Foundation plans are usually not required for trestle bent type construction. However, they may be required on complex bridgework conditions.
- e) Foundation plans are usually required for pier type construction and should include information described in items "a - c" above.
- f) Details and information required to construct the bridge foundations shall be placed in tables for all projects. However, the information furnished in the tables should be properly correlated to the foundation drawings. Also, the tables should be located close to the foundation drawings.
- g) Actual maximum pile or shaft loads shall be shown in the plans for each pier or bent. Maximum soil pressure (dead load, live load) shall be shown in the plans for other foundation types such as spread footings and retaining walls.

SPECIAL DETAILS, (spans, girders, bents, piers, footings, approach slabs, joints, bearings, retaining walls, etc.)

1. The design drawings shall include full details showing type of construction details of all structural members, connections, and splices and summary of quantities for each structural item.
2. All the structural drawings shall be to scale.
3. Tables may be utilized for similar structural items and details - provided the information in the tables and the detail drawings are properly correlated.
4. A deformed reinforcing steel summary of quantities is to be provided in the plans (including bar bending details) for each part of the bridge structure (spans, including precast concrete girders<sup>5</sup>, bents, piers, footings, columns, etc.). Dimensions relating to reinforcing steel fabrication are out-to-out of bar. Dimensions relating to reinforcing steel spacing are center-to-center of bar.
5. Listed below is some general information, which should be included in the plans when applicable.

---

<sup>5</sup> The reinforcing estimated quantities provided for such structure parts as precast-prestressed concrete members paid for per linear foot are for information purposes only. In such case as this, estimated quantities should be provided for a example (or nominal) members of each type.

- a) Camber diagrams for proper fabrication of bridge members and construction of superstructure. Camber diagrams to include separate ordinates for beam dead load and any dead load to be placed upon the member (such as bridge barrier, curb, handrail, wearing surface) after the deck concrete is poured. Final camber ordinates must include correction for vertical curves.
- b) End and intermediate superstructure diaphragms to be located relative to centerline of joint.
- c) Bearing assemblies are to be fully detailed and the finished bearing elevation of each bearing are to be shown (in tables or special details).
- d) Beam dead load reactions for all bridge structures.
- e) Live load and dead load moments and shears for all steel spans. For curved steel spans show LL + DL moments and shears at 20th points.

## STANDARD BRIDGE PLANS AND SPECIAL DETAILS

The Bridge Design Section maintains standard plans and special details for various structural bridge members, permanent signing and guardrail. These standard bridge plans and special details may be obtained upon written request to the Bridge Design Engineer for incorporation into any DOTD project. These standard plans and special details should be included in the final plans when they can be used. For more information, refer to chapter 8.

## MOVABLE BRIDGES

The final plans for mechanical drawings shall show complete layouts of the mechanical systems. All parts to be completely detailed and all commercial equipment shall be completely specified. A complete "bill of materials" shall be included in the mechanical plans. Since the Department has its own method of presenting mechanical drawings, the Engineer should become familiar with the detail practice of the Bridge Design Section prior to beginning any work. Details for the mechanical system should be similar to details usually presented in mechanical shop drawings.

## ELECTRICAL PLANS

1. The final plans shall include complete electrical plans, including conduit and equipment layout; control schematics; and complete details of all fabricated, assembled, or otherwise made-up parts; and complete specifications of all commercial equipment and apparatus. Furnish complete design of electrical and illumination systems and of all components. Since the Department has its own

method of presenting the wiring diagrams, the Engineer should become familiar with the detail practice of the Bridge Design Section prior to beginning any work.

2. The plan shall include complete power and control elementary wiring diagrams with all conductors and equipment and apparatus identified; complete conduit and wire layout; detail drawings and equipment list.
3. When necessary, written special provisions shall be supplied.
4. The Engineer shall be responsible for obtaining written confirmation from the utility company as to their ability to supply proposed load.

#### PERMANENT SIGNING PLANS

1. For projects requiring permanent signing, separate detail sheets showing the signing layout, signing quantities and specific signing details are required. The permanent signing is normally coordinated through our Geometric Design Section.
2. Permanent signing standard details are maintained by the Bridge Design Section. These details include small ground signs (breakaway) and large overhead signs. Structure mounted special support details (bridge, median barrier, retaining wall, etc.) for large overhead signs are not shown on the standard sign details; these must be designed and detailed on an individual basis for each specific sign when required.

#### Bridge Plans In Final Form (A.C.P's submittal procedure)

1. The Engineer shall submit "reproducibles" of the "Advance Check Prints" (95% Final Plans) along with any required special provisions and a construction cost estimate for review and comments. Each sheet must be stamped by a Civil Engineer registered by the State of Louisiana.
2. The plans, specifications, and estimates are to be reviewed by the Department of Transportation and Development and others that may be involved such as the Federal Highway Administration, etc. The Department will advise the Engineer of all comments, errors and omissions relative to the plans, specifications, and estimate; which shall be revised and/or corrected by the Engineer. Please be advised that this is only a cursory check and the Engineer is responsible for the accuracy and completeness of the plans.
3. The Engineers are to work closely with the Department in order that the final plans, specifications and estimates may be completed and ready for the proposed contract letting date.

Final Plan Payment Milestones Table				
PAYMENT MILESTONE	TASKS	BRIDGE	COMMON	ROAD
30 % Distribution	Completed	<ol style="list-style-type: none"> <li>1. General plan</li> <li>2. Framing plan</li> <li>3. Superstructure design</li> </ol>		<ol style="list-style-type: none"> <li>1. Submit final typical sections for review &amp; approval</li> </ol>
	In Progress	<ol style="list-style-type: none"> <li>1. Foundation layout</li> <li>2. Lighting and signing design</li> <li>3. Superstructure details</li> <li>4. Substructure design</li> </ol>		<ol style="list-style-type: none"> <li>1. Review R/W maps</li> <li>2. Finalizing hydraulic design</li> <li>3. Finalizing vertical &amp; horizontal geometry</li> <li>4. Finalizing construction notes</li> </ol>
60% Distribution	Completed	<ol style="list-style-type: none"> <li>1. Superstructure details</li> <li>2. Substructure design</li> <li>3. Foundation layout</li> <li>4. Lighting and signing design</li> </ol>	<ol style="list-style-type: none"> <li>1. Submit for sequence of construction and construction signing review</li> </ol>	<ol style="list-style-type: none"> <li>1. Submit for final drainage</li> </ol>
	In Progress	<ol style="list-style-type: none"> <li>1. Substructure details</li> <li>2. General notes</li> <li>3. Summary of quantities</li> </ol>		<ol style="list-style-type: none"> <li>1. Summary sheets</li> <li>2. Joint Layouts</li> <li>3. Graphical grades</li> </ol>
90 % Distribution	Completed		<ol style="list-style-type: none"> <li>1. Pre-ACP submitted for review prior to distribution</li> </ol>	
95 % Distribution	Completed		<ol style="list-style-type: none"> <li>1. Advance Check Print distribution</li> <li>2. Cost estimate</li> </ol>	
	In Progress		<ol style="list-style-type: none"> <li>1. Special Provisions</li> </ol>	
98 % Distribution	Completed		<ol style="list-style-type: none"> <li>1. ACP comments addressed</li> <li>2. Final cost estimate</li> <li>3. Entire set of original plan sheets transmitted to Contracts Unit</li> <li>4. Special provisions</li> </ol>	
100 %	Completed		<ol style="list-style-type: none"> <li>1. Plans, Specifications &amp; Estimate.</li> <li>2. Plans &amp; Estimate transmitted to General Files</li> </ol>	

## CONSTRUCTION ENGINEERING SERVICES

For those engineering contracts in which the Engineer is to provide services pertaining to review and approval of construction contractor's shop drawings and/or working drawings; listed below are comments relative to these services:

Once the Department authorizes the construction contractor to begin work on the project, the Engineer shall provide such services as are required to check and approve shop drawings, and other working drawings. Final Checked Prints shall be stamped "Approved" and dated, and one (1) print of each shall be retained by the Engineer; and the remaining 8 prints of each drawing shall be distributed by the Engineer.

The distribution by the Engineer will be to the following:

Number of plan sets	Department/organization
3	DOTD Construction Engineer (headquarters) Attn: DOTD Fabrication Engineer (2 copies) Attn: DOTD Structural Construction Engineer (1copy)
1	DOTD District Administrator
2	DOTD Project Engineer
1	Fabricator
1	Contractor

A note will be shown on the transmittal letter for distribution of the drawings stating that the DOTD Structural Fabrication Engineer shall be given notice (10) working days before work is to begin. The engineer will also be required to examine all erection drawings submitted.

## DESIGN POLICY GUIDE FOR BRIDGES AND STRUCTURES

### GENERAL

The information contained herein is to set forth a design policy guide for the Engineer to follow in preparation of bridge plans, specifications, and estimates. These criteria are supplemental to the latest Department design standards, (freeways, arterials, collectors, and local roads and streets); any project memorandums written to the engineer by the project coordinator or the Bridge Design Engineer; and the AASHTO Standard Specifications for Highway Bridges, latest edition, along with current Interim Specifications.

Final design and preparation of contract plans will be based on the applicable part of these design criteria and preliminary plans as approved by the Louisiana Department of Transportation and Development, the Federal Highway Administration, and others.

Refer to other chapters in the Bridge Manual for specific design criteria not covered in this section.

### DESIGN

#### SPECIFICATIONS:

##### Design Specifications

- a) AASHTO "Standard Specifications for Highway Bridges", latest edition, with current interim specifications and all other pertinent specifications referenced in Chapter 3 of this manual.
- b) "Bridge Design Manual" prepared by the Bridge Design Section of the Louisiana Department of Transportation and Development.
- c) Memorandums and any revisions to the "Bridge Design Manual" issued by the Bridge Design Engineer periodically.
- d) Project structural design criteria shall govern over the above specifications.



### Construction Specifications

- a) Latest approved Louisiana DOTD Standard Specifications for Roads and Bridges.
- b) Special provisions and supplemental specifications.

### Welding Specifications

Welding of structural steel, steel pipe and tubular members, reinforcing steel and aluminum alloys shall conform to Section 815 of the latest edition of the DOTD Standard Specifications for Roads and Bridges.

### Loading

- a) Dead Load - Calculated weight of structure plus 12 psf future wearing surface. Dry weight of earth 100 lbs/cu.ft.; equivalent fluid pressure 30 lbs/cu.ft.
- b) Live Load - Design Live Load shall be AASHTO designation HS20-44 Truck or Lane Load or HST-18 Truck Load, whichever governs except that HST-18 shall generally not be used for local roads and streets except where heavy truck traffic exists. Alternate Military Load shall be applied on the Interstate System. Only HS20-44 Truck or Lane Loading shall be used for fatigue design when applicable. For two design traffic lanes, the load lanes may be adjacent to and touching one another, causing the wheel loads to be 4 feet apart.
- c) Wind Loads - Wind forces are to be applied in accordance with the AASHTO Specifications.
- d) Seismic Loading must be investigated in accordance with the AASHTO Specifications (Guide Specifications for Seismic Design of Highway Bridges).
- e) Other loads such as temperature and stream forces shall be in accordance with the latest AASHTO specifications.

### Materials and Required Strengths

- a) Reinforcing Steel - Reinforcing steel bars shall be Grade 60.

- b) Prestressing Strand - Prestressing strand for precast prestressed AASHTO girders shall be ½" nominal diameter uncoated seven (7) wire low relaxation strands of ultimate strength 270 ksi.
- c) Concrete
  - 1) Concrete for frame bent footings, columns and caps, pile bent caps, and abutments shall be Class "A" as defined by the Standard Specifications. With a design strength of 3000 psi.
  - 2) Concrete for deck slab, approach slabs, diaphragms, and barrier railing shall be Class "AA" as defined by the Standard Specifications with a design strength 3200 psi.
  - 3) Concrete for prestressed concrete AASHTO girders shall be Class "P" with a  $f'_c$  (initial) of 4000 psi and a 28 day  $f'_c$  of 5000 psi . Class "P(M)" with a  $f'_c$  (initial) of 4500 psi and a 28 day  $f'_c$  of 6000 psi. Girder designs requiring higher concrete strengths shall have Department approval prior to inclusion into final design plans.
  - 4) Concrete for prestressed concrete piles shall be Class "P" with a  $f'_c$  (initial) of 4000 psi and a 28 day  $f'_c$  of 5000 psi .
  - 5) Drilled Shafts shall be class "S" concrete.

Superstructure Design: Refer to Chapter 5 for further information.

Substructure Design: Refer to Chapter 6 for further information.

Bridge Embankments and Retenments: Refer to Chapter 6 for further information.

Environmental/permit information: Refer to Chapter 7 for further information.

### Utilities

Provisions will be made for any utilities on or within any structure when deemed necessary. Existing utilities will be relocated when required.

### Lighting and Permanent Signing

Supports for signs and luminaries, including anchor bolts, nuts, and washers, shall be detailed in the plans. See Chapter 10 for permanent signing information.

## DETAILS

### Detailing Practices

1. The plans shall be prepared in conformance with the General Guide for Bridge Plan Preparation and Chapter 9 of this manual.
2. Reinforcing
  - a) All reinforcing shall be detailed in accordance with the Code of Standard Practice of the Concrete Reinforcing Steel Institute.
  - b) All bending dimensions shall be "out-to-out".
  - c) No allowance shall be made in bar lengths for bends, except for hooks. Maximum bar lengths shall be 40 ft for #4 bars, and 60 ft for #5 bars through #11 bars. Bar sizes greater than #11 bars will not be permitted. Lap splices shall be as specified by AASHTO.
  - d) The minimum concrete cover from the surface of the concrete to the face of any deformed reinforcing bar shall not be less than the following:

Top of deck slab = 2 in.  
Bottom of deck slab = 1 in.

Precast Piles = 3 in. (except for 12" or 14" piles which shall have 2" cover).  
All other reinforcing bar cover shall be 2 in. unless otherwise noted in plans.
  - e) Complete bar lists shall be placed with each unit of the structure on the final plans.

## MISCELLANEOUS

1. Summary of Quantities - When preparing contract plans with test piles, it is mandatory that certain items be included in the bridge summary of quantities. Refer to Chapter 6 for test pile information.
2. Design computations shall be maintained by the Engineer and shall be neatly arranged, clearly identified and bound. This information will be available upon request by the Department. Quantity computations and cost estimates will be prepared similar to design computations and submitted with the final plans. All computations should be stamped by a licensed Louisiana Professional Engineer.
3. When plans are submitted to the Department of Transportation and Development by a Consultant Engineer for review, such plans shall be accompanied by a written certification from the Engineer that a detailed check has been made prior to submission.